AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS:

1. (Currently Amended) A method of decoding a multidimensional symbol, the method comprising the steps of:

receiving a plurality of signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into a sub-optimal decoder and

generating an estimated transmitted multidimensional symbol $\tilde{\mathbf{S}}$ therefrom;

decoding the estimated transmitted symbol vector $\tilde{\mathbf{S}}$ via hierarchical subset decoding and determining a subset therefrom;

generating a reduced search space *V* associated with the subset; and

decoding $\mathbf{y}_1 \ldots \mathbf{y}_k$ via minimum distance decoding using the reduced search space *V* in order to obtain one of the following: the estimated transmitted multidimensional symbol $\hat{\mathbf{S}}$ in space *V*, soft bit information, hard bit information.

2. (Currently Amended) The method according to claim 1 wherein the step of generating a reduced search space *V* comprising generating the reduced search space *V* ~~via~~by ~~the minimization~~minimizing ~~of some~~ a metric ~~*d*~~.

3. (Currently Amended) The method according to claim 1 wherein the step of generating a reduced search space *V* associated with the subset ~~comprises~~comprising generating a reduced search space by minimizing a metric ~~*d*~~ corresponding to the subset prior to generation of the subset.

4. (Currently Amended) The method according to claim 1 wherein the step of receiving the plurality of signal vectors $\mathbf{y}_{1...k}$ into athe sub-optimal decoder and generating an estimated transmitted multidimensional symbol $\tilde{\mathbf{S}}$ therefrom ~~comprises~~further comprising receiving athe plurality of signal vectors $\mathbf{y}_{1...k}$ into a sub-optimal decoder and generating soft bit information therefrom.

5. (Currently Amended) The method according to claim 1 wherein the step of decoding the received the plurality of signal vectors $\mathbf{y}_{1...k}$ via minimum distance decoding using the reduced search space *V* and generating a multidimensional symbol $\hat{\mathbf{S}}$ therefrom ~~comprises~~further comprising decoding the received ~~symbol~~signal vectors $\mathbf{y}_{1...k}$ via minimum distance decoding using the reduced search space *V* and generating a multidimensional symbol $\hat{\mathbf{S}}$ in space *V* therefrom.

6. (Currently Amended) The method according to claim 1 wherein the step of receiving signal vectors $\mathbf{y}_{1...k}$ into a sub-optimal decoder and generating an estimated transmitted multidimensional symbol vector $\tilde{\mathbf{S}}$ therefrom ~~comprises~~comprising receiving signal vectors $\mathbf{y}_{1...k}$ into an interference cancellation decoder and generating ~~an~~the estimated transmitted symbol vector $\tilde{\mathbf{S}}$ therefrom.

7. (Original) The method according to claim 6, wherein the interference cancellation decoder is selected from the group consisting of a successive interference cancellation decoder, and a parallel interference cancellation decoder.

8. (Currently Amended) The method according to claim 1 wherein the step of receiving signal vectors $\mathbf{y}_{1...k}$ into an ordered or unordered linear decoder and

generating an estimated transmitted multidimensional symbol vector $\tilde{\mathbf{S}}$ therefrom comprising receiving the plurality of signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into ~~an unordered linear decoder and generating an estimated transmitted multidimensional symbol vector $\tilde{\mathbf{S}}$ therefrom comprises receiving signal vectors $\mathbf{y}_1 \ldots \mathbf{y}_k$ into~~ a suboptimal decoder and generating ~~an~~the estimated transmitted multidimensional symbol vector $\tilde{\mathbf{S}}$ therefrom.

9. (Currently Amended) The method according to claim 8, wherein the ~~unordered~~ linear decoder consists of a decoder selected from the group consisting of a zero forcing decoder, a MMSE decoder, and a matched filter receiver.

10. (Original) The method according to claim 1, wherein the multidimensional transmitted symbol $\hat{\mathbf{S}}$ is represented by the relationship $\hat{\mathbf{S}} = \arg\min_{\mathbf{v} \in V} m(\mathbf{y}_1, \ldots, \mathbf{y}_k, \mathbf{v})$, and wherein m is any metric.

11. (Currently Amended) The method according to claim 1, wherein the step of decoding the estimated transmitted symbol vector $\tilde{\mathbf{S}}$ via hierarchical subset decoding and determining a subset therefrom comprises the steps of:

defining a hierarchical subset as an ordered set of subsets that cover a multidimensional constellation, wherein the hierarchical subsets are ordered such that if ~~Hk and Hn are coverings of the constellation, and k<n, then union (Hk, Hn)=Hk~~R_k is a subset of the multidimensional signal space that the signal is detected to lie within at some step k, it can be further deived into subsets {R_{n,1}, ..., R_{n,L}} such that the union of these subsets spans R_k; and

decoding the received symbol vectors over the ~~covering Hk~~ subset R_k using a desired distance.

12. (Currently Amended) The method according to claim 11, wherein the given multidimensional symbol is detected to lie within R_k at some step k the receiver can further determine whether the multidimensional symbol lies in one of the subsets {R_{n_1}, ..., R_{n,L}} by computing the Euclidean distance between the received symbol vector and the centeriod of each of the subsets. ~~desired distance comprises the Euclidean distance of the received vector from the center of each of the sets within Hk.~~

13. (Currently Amended) The method according to claim 11, wherein the step of decoding the received symbol over the ~~covering Hk using a desired distance comprises the steps of:~~ set R_k intersect V, where V is the multidimensional symbol constellation, using maximum likelihood ML or minimum distance decoding over the reduced search space.

~~returning a set Vk in Hk;~~

~~decoding to a subset V(j+1) in intersection (H(j+1), Vj) at the (j+1) stage of decoding;~~

~~terminating the hierarchical decoding when j is equal to a desired integer L; and~~

~~implementing maximum likelihood ML decoding using VL as a reduced search space.~~